DOCUMENT RESUME

ED 293 898 TM 011 595

AUTHOR Barry, Martha H.
TITLE The Effect of Field-Dependence-Independence Match and Mismatch of Student and Teacher on Science Achievement.
PUB DATE [86]
NOTE 12p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; *Elementary School Science; *Field Dependence Independence; Grade 7; Grade 8; Junior High Schools; Student Characteristics; Teacher Characteristics; *Teacher Student Relationship
IDENTIFIERS *Science Achievement

ABSTRACT

A study involving 907 students and 14 teachers at South Carolina public schools investigated the link between teacher-student cognitive style matches and mismatches and science achievement in grades 7 and 8. The students included 426 males and 481 females, 404 seventh graders and 503 eighth graders, and 569 caucasian and 335 black students; three students fell into other racial categories. The teachers included three males and 11 females and 10 caucasian and four black subjects. Cognitive style was measured via the Group Embedded Figures Test, while science achievement was indicated by the students' grades in science. Results indicate that science achievement was significantly higher when a field-independent student was matched with a field-independent teacher and significantly lower when a field-dependent student was matched with a field-dependent teacher. Mismatching of student and teacher resulted in approximately the same science achievement level regardless of the direction of the mismatch. (TJH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED293898

The Effect of Field-Dependence-Independence Match and Mismatch of Student and Teacher on Science Achievement

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

MARTHA H. BARRY

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Martha H. Barry
Office of Field Experience
College of Education
University of South Carolina
Columbia, SC 29208

This proposal for this paper was first written as part of the coursework in a graduate education psychology course. The author gratefully apppreciates the comments and suggestions of the professor, Christine M McCormick and the class.

TM 011 595

The Effect of Field-Dependence-Independence Match and Mismatch of Student and Teacher on Science Achievement

The cognitive style variable of field-dependence-independence has been extensively studied and has proven to have definite implication for the teaching-learning process (Witkin, Moore, Goodenough, & Cox, 1977). Saracho (1978, 1980, 1986), Saracho and Drayton (1980) and Saracho and Spodek (1981) have studied the effect of field-dependence-independence on academic achievement for students up to grade eight and Jolly & Strawitz (1984) have investigated the effect of teacher-student cognitive style and achievement in biology but a missing area of research study is the effect of teacher-student cognitive style matches and mismatches on middle school science achievement. The study was designed to investigate the link between teacher-student cognitive style matches and mismatches on science achievement in grades seven and eight.

Theoretical Framework

Educators have long noted that people react in different ways to the same stimuli. Some of this difference may be explained by cognitive style. Cognitive style is a broad, systematic characteristic affecting an individual's reactions to different situations (Wallach, 1962; Anastasi, 1976). One important aspect of cognitive style which has been extensively studied is field-dependence (FD) versus field-independence (FI). However, there has been limited research on the relationship between the cognitive style dicotomy FD - FI and teaching methods and styles.

The learning style FD - FI is a stable and pervasive characteristic of a person, expressed through the interaction of behavior and

personality as an individual approaches a task. The FD or FI learning style has an effect on teaching and learning. The teacher's learning style helps determine the curriculum in terms of materials, methods, and evaluation. The student's style helps determine how and what students learn.

DiStefano (1970) reported matched teacher-student cognitive style resulted in a more positive view of each other than a mismatch combination. Saracho (1978) found FD teachers ranked mismatched students more negatively than did FI teachers. The two studies support the argument that matched style combinations tend to like each other better and rate each other more favorably than mismatched combinations.

The FD - FI characteristic has manifested itself in several behaviors which affect learning and teaching. Saracho (1986) reports that FD individuals make better teachers of young children because they provide a warm relationship to support children's learning. Saracho and Drayton (1980) report FD teachers prefer discussion and discovery approaches while FI teachers prefer lecturing. FD persons exhibit a strong interest in people and social affairs, therefore FD teachers may place more stress on social goals. FI persons are detached, impersonal, and oriented toward striving, therefore FI teachers may place more stress on achievement.

Saracho and Spodek (1981) report that FD students prefer group and exploratory experiences, while FI students prefer to work by themselves or to recieve impersonal, direct types of instruction. Saracho and Spodek (1981) also report FD individuals rely on the surrounding perceptual field and relate experiences in a global fashion, while FI

individuals perceive items separate from the field and abstract items and solve problems reorganized in different contexts.

Packer and Bain (1978) found when undergraduate psychology students attempted to learn a mathematical concept a match between teacher and student for FD - FI resulted in superior achievement. Saracho and Drayton (1980) found academic achievement on a standarized test for second and fith grade students was higher if the students had a FI teacher rather than a FD teacher. Jolly and Strawitz (1984) found for tenth grade biology students FI students achieve equally well with FI or FD teachers but FD students achieve more if taught by FI teachers.

Purpose

This study was designed to determine if middle school students who match their teacher's cognitive style (FD - FI) achieve more than middle school students who do not match the teacher's style.

Methods

Population

The population consisted of students in South Carolina public schools in grades seven and eight. These grades were selected because students in those grades are required to complete a regularly scheduled science class. Students in grade nine and above enroll in differentiated science courses depending on their abilities and interests. This would make equating science acheivement scores more difficult. Students who had been retained, who received special services (eg, special education), and who had spent less than 90% of the school semester in that class were omitted from the study. Schools were

selected to conform to a representative sample of all schools in South Carolina.

Student Demographic Data

Males	426	Grade 7	404	Caucasian	569
Females	481	Grade 8	503	Black	335
				Other	003

Teacher Demographic Data

Males	03	Caucasian	10
Females	11	Black	04

Instruments

The independent variable was cognitive style of teacher and student which resulted in a match or mismatch for FD - FI as measured by the Group Embedded Figures Test. The dependent variable was science achievement as measured by the first semester grade in the student's science class.

Field-dependence and field-independence are categorized as two extremes of learning styles. For the purposes of this study, teachers and students were categorized as FD or FI by the score on the GEFT - Group Embedded Figures Test (Witkin, Oltman, Raskin, & Karp, 1971). Reliability coefficients of 0.81 and 0.82 have been reported for the test (Denson, 1977, Witkin et al., 1971). This test is an accepted valid measure of the cognitive style dimension field-dependent and field-independent.

Science achievement was measured by the students' first semester numerical grade in their science class. It was felt that this measure was a truer indication of science achievement than a standardized measure. The majority of the grade was determined by teacher designed objective tests. This variable was assumed to be continuous and on an interval level.

Procedures

All science teachers and their students in selected schools were tested. The GEFT was administered to students during a mid-week science class by their regular teacher. Teachers were administered the GEFT during a regular teacher's meeting. The GEFT was scored by the researcher. A random sample was independently scored by a trained scorer to asssure accuracy. A 2 (teacher cognitive style) X 2 (student cognitive style) ANOVA was performed to test the effects of teacher and student cognitive styles match and mismatch for FD - FI on science achievement.

Results

Results showed a significiant difference between groups at $p < 0.05$. Science achievement was significantly higher ($p < 0.05$) if a field-independent student was matched with a field-independent teacher. Science acheivement was significantly lower ($p < 0.05$) if a field-dependent student was matched with a field-dependent teacher. Science achievement was approximately the same if a field-independent student was mismatched with a field-dependent teacher or if a field-dependent student was mismatched with a field-independent teacher.

In comparing matched pairs, field independent matches performed significantly better than field dependent matches with regard to student science achievement. In comparing mismatched pairs, the science acheivement of the student was higher if the teacher was field-dependent and the student was field-independent than if a field-dependent student was with a field-independent teacher. This was not signifcantly different.

Student	Field-dependent	Field-independent
Teacher		
Field-dependent	Lowest Science Grade	Middle Science Grade
Field-independent	Middle Science Grade	Highest Science Grade

Conclusions

The results of this study support the idea that a cognitive style match between teachers and students can lead to higher achievement if the match is field-independence. This finding supports the conclusions found by Packer and Bain (1978), Saracho and Drayton (1980), and Jolly and Strawitz (1984). The findings in this study contradict the idea that a cognitive style match between teachers and students can lead to higher achievement if the match is field-dependent. The findings do not support the conclusions found by Packer and Bain (1978) while supporting the conclusions found by Saracho and Drayton (1980) and Jolly and Strawitz (1984). The results of this study differed from all of the previously mentioned in that there was no signficant difference between the students who were mismatched with their teacher (field-dependent

student with field-independent teacher or field-independent student with field-dependent teacher).

Possible explanations for these results may be obtained from the literature on cognitive styles. FD teachers prefer discussion, focus on social goals and do not provide structure, organization, and explicit instructions. FI teachers are academically oriented, focus on academic goals, and provide corrective feedback on performance. FD students like to work in groups, are concerned with people and social concerns, and rely on authority. FI students prefer structure, impersonal methods of learning, and exhibit active striving for self - defined goals. FI teachers may provide instruction designed to aid students in scoring well on objective tests. FI students may learn facts which aid them in scoring well on objective tests.

The academic goals of the schools could account for the differences. Perhaps, emphasis is placed on testing and obtaining facts to answer questions. This would tend to favor the learning style of the field-indpendent student and the teaching style of the field-independent teacher.

Implications

People bring to a learning situation their own individuality. Consideration of individual differences can have profound implications for both teaching and learning. If we know something about the educational preferences of children and the kinds of learning experiences which lead to the greatest achievement, then we can design programs to achieve optimal learning. Since cognitive style is related to an individual's psychological, educational, and personality

attributes, it is an important factor in designing educational programs. An early assessment of the student's cognitive style can aid teachers in designing an appropriate curriculum and teaching methodology. Students can be provided with experiences via technology related to their personal cognitive style initially to provide them with a feeling of security and trust in the educational system. It would then seem that the most appropriate strategy would be to extend the repertoire of each individual beyond the scope of their dominant cognitive style. Teachers can be helped to extend their range of teaching methods to include both styles. Students could be provided opportunities to achieve in activities that are not representative of the dominant cognitive style. The challenge to educators is to create a variety of educational program alternatives to meet the different styles.

References

Anastasi, A. (1976) Psychological Testing. New York Macmillan.

Denson, T. A. (1977) Three measures of cognitive style: characteristics, factor structure, and implications for researchers. Paper presented at the meeting of the American Educational Research Association, New York, April 1977. (ERIC Document No, Ed 137 344)

DiStefano, J. J. (1970) Interpersonal perceptions of field independent and field dependent teachers and students. (Doctoral disseration, Cornell University, 1969). Dissertation Abstracts International, 31, 463A - 464A.

Garger, S. & Guild, P. (1984) Learning styles: the crucial differences. Curriculum Review, 23(1), pp. 9 -12.

Jolly, P. E. & Strawitz, B. M. (1984) Teacher - student cognitive style and achievement in biology. Science Education, 68(4), pp. 485 - 490.

Packer, J. & Bain, J. D. (1978) Cognitive style and teacher-student compatibility. Journal of Educational Psychology, 70(5), pp. 864 - 871.

Saracho, O. N. (1980) The relationship between the teachers' cognitive style and their perceptions of their students' academic achievements. Educational Research Quarterly, 5(3), pp. 40 - 49.

Saracho, O. N. (1978) The relationship of the match of teachers'-students' cognitive style to teachers' perceptions of students' competence (Doctoral dissertation, University of Illinois at Urbana-Champaign, 1978) Dissertation Abstracts International,

39, 2738A.

Saracho, O. N. (1986) Teachers' cognitive styles and their perceptions of their matched and mismatched children. Paper presented at the meeting of the American Educational Research Association, San Francisco, April 1986.

Saracho, O. N. & Drayton, C. M. (1980) Relationship of teachers' cognitive styles to pupils academic achievement gains. Jounal of Educational Psychology, 72(4), pp. 544 - 549.

Saracho, O. N. & Spodek, B. (1981) Teachers' cognitive styles: educational implications. The Educational Forum, 45(2), pp. 153 - 159.

Wallach, M. A. (1962) Commentary: active - analytical vs. passive - global cognitive functioning. In S. Messicak & J. Ross (eds.), Measurement in personality and cognition. New York; Wiley.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977) Field - dependent and field - independent cognitive styles and their educational implications. Review of Educational Research, 47(1), pp. 1 - 64.

Witkin, H. A. Oltman, P. K., Raskin, E. & Karp, S. A. (1971) A manual for the embedded figures test. Palo Alto, CA: Consulting Psychologists Press.